

MODERN HEATING



Warren Webster & Company, Camden, N. J.

Pioneers of the Vacuum System of Steam Heating

60 U. S. Branches—In Canada, Darling Bros., Ltd., Montreal

WARREN WEBSTER & COMPANY

Steam Heating Systems and Steam Specialties

FACTORY AND MAIN OFFICE
CAMDEN, NEW JERSEY

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THE ATMOSPHERIC STEAM HEATING CO., LTD., 22 Broadway, WESTMINSTER, LONDON, ENG.

Products and Services

WEBSTER MODERATOR SYSTEM of STEAM HEATING.

IMPROVED WEBSTER VACUUM and IMPROVED TYPE "R" SYSTEMS of STEAM HEATING.

WEBSTER VACUUM and TYPE "R" SYSTEMS of STEAM HEATING.

WEBSTER SYSTEM EQUIPMENT.

MODERNIZATION of Obsolete and Faulty Heating Systems.

The Company

WARREN WEBSTER & COMPANY have grown steadily since 1888 and at present have an ample plant, more than 60 United States branches and Canadian and British representatives. As owners of the recognized basic vacuum system patents, the Company was the pioneer in the development of the vacuum system of steam heating and has specialized continuously in the problem of steam economy and steam circulation.

WARREN WEBSTER & COMPANY do not manufacture, sell or assume responsibility for boilers, piping or other equipment not of their manufacture, nor for service to such apparatus. The Company does not install heating systems—Webster Systems are installed by heating contractors—but does go to great length to insure that installations shall be made correctly.

Webster Systems Are Endorsed by Architects, Engineers and Heating Contractors

Almost one-third of the country's leading architects have specified Webster Systems for their finer buildings; many of the largest consulting engineers use Webster Systems; while more than 2600 heating contractors install Webster Systems. Most of these use Webster Systems and Equipment repeatedly.



Four Elements of Webster Systems of Steam Heating

Webster Systems combine the following four elements, each of which is essential:

(1) **Service**—By a comprehensive organization of trained steam heating specialists covering every State in the Union. Webster Service is part of every Webster System. It includes carefully prepared printed instructions

and personal co-operation of a corps of trained steam heating engineers. It provides help on each of the following points:

(a) Determines the type of system best suited to the particular building, locality and specialized operating conditions.

(b) Decides the correct Webster System Equipment to insure perfect circulation of steam at least cost.

(c) Provides printed instructions for steamfitters.

(d) Inspects work during installation and, on completion, as conditions warrant.

(e) Provides printed instructions for the engineer or janitor in correct operation of the Webster Systems when necessary.

(2) **Experience**—Gained in providing more than 60,000 successful Webster Systems of Steam Heating.

(3) **Webster System Equipment**—Comprising a complete line of steam heating appliances proven correct in design by test and use.

(4) **Webster Engineering Methods**—Developed by our experience and in our extensive laboratories. They assure correct application of Webster System Equipment.

Consulting Service

Architects and engineers are invited to call in the nearest Webster sales-engineer at an early stage of the planning in order to assure best co-ordination of effort.

A SYSTEM FOR EVERY HEATING NEED

Webster Systems can be adapted to meet the heating requirements of practically every type and size of building. These systems include a complete line of heating system equipment.

A Webster System can be provided that is *specifically adapted to every heating need or problem.*

Webster MODERATOR System of Steam Heating

"Controlled-by-the-Weather"

The Webster MODERATOR System, properly operated, varies the supply of steam to the entire heating system and to all parts of it in accordance with changes in demand resulting from changes in weather and occupancy conditions. It solves the overheating problem by obtaining the following results:

(1) Fully automatic variation for changes in outdoor temperature, shutting off or turning on radiation, variation of steam pressure and variation in vacuum.

(2) Convenient manual variation for changes in weather conditions other than temperature and for quick heating up and night load conditions.

The Webster MODERATOR System does not control the temperature in each room but *moderates* the excesses of overheating and underheating. It delivers to all radiators simultaneously and *regardless* of distance from the boiler, the quantity of steam necessary to heat, without overheating. If certain radiators are shut off, the MODERATOR System immediately and automatically alters the supply of steam to the remaining radiators to correct for the change in demand. If the outside temperature goes up, the MODERATOR System immediately and automatically *moderates* the quantity of steam delivered to each radiator to meet the changing temperature. If firing is uneven the Webster MODERATOR System automatically irons out the resulting variations in steam supply. A "runaway" fire causes no overheating with its constant waste.

The Webster MODERATOR System is adaptable to buildings requiring approximately 5000 sq. ft. or more of radiation. It may be applied either to new buildings or to the modernization of systems in existing buildings.

The IMPROVED Webster Vacuum System

Basically, this is the well-known Webster Vacuum System with the addition of a specially selected standard metering orifice in each radiator valve. The IMPROVED System assures correct distribution—all radiators get steam at the same time and substantially in proportion to the need for steam. Eliminates the last "cold spot," operates equally well with fluctuating boiler pressures, high and low vacuum. Increases flexibility, permits quicker heating up, paves the way for economy producing operation. Operating requirements of the newer fuels such as oil and gas are fully met. Better-than-ever heating service with older fuels is obtained.

The IMPROVED Webster Type "R" System

This Webster System is specially fitted for use with oil and gas burners, light-weight radiation and installations where burners are controlled by a thermostat located in a "key" room. In addition improved heating service is obtained with coal and other fuels and with older types of radiation.

As in the IMPROVED Webster Vacuum System, a specially selected standard metering orifice is placed in

The architect can now select from a number of basic Webster Systems—each built to meet certain conditions; each a combination of service, experience, equipment and engineering methods varied to meet the heating requirements of the individual installation.

each radiator valve to provide equalized and balanced steam distribution.

The IMPROVED Webster Type "R" System is an open return or gravity system adaptable to any type of building in which the boiler may be placed with its water-line below the level of water of condensation flowing back to it.

The Webster Vacuum System

The Webster Vacuum System provides positive circulation of low pressure steam, either live or exhaust, or a combination of both. Particularly well adapted for heating industrial plants; where a group of buildings are scattered over a considerable area; where one or more buildings are so located with respect to the boiler plant that lifts are necessary in the return piping; where exhaust steam from engines is utilized for heating; and in cases where it is impossible to pit the boiler at the lowest point in the system. Adapted for use with unit heaters of either the floor or suspended types as well as with cast iron and pipe coil radiators.

The Webster Type "R" System

Webster Type "R" System of Steam Heating is adaptable to almost every type building, except the very largest, where Webster Vacuum Systems are used—practically the only limitation being the necessity for a basement or other depression, so that the boiler may be placed with its water line below level of water of condensation flowing back to the boiler. In some cases where the boiler cannot be so placed, a Type "R" System may be used in conjunction with a suitable condensation pump.

A Type "R" System may be used in connection with boilers burning coal, oil, gas or any other fuel. It may be used with steel or with cast iron boilers and, with slight modification, with steam taken from a street supply.

Provided for installations up to 32,000 sq. ft. of equivalent direct cast iron radiation. Adapted for use with unit heaters of either the floor or suspended types, as well as with cast iron and pipe coil radiators.

Simple in design, economical and responds quickly. Can be operated safely and satisfactorily by unskilled labor.

Webster System Equipment

Used as needed in Webster Systems of Steam Heating includes the following:

Sylphon Traps; Series 7 Traps; Type "W" Supply Valves; Sylphon Quick-opening Packless Valves; Three-point Valves; Dirt Strainers; Dirt Pockets; Drip Traps; Heavy Duty Traps; Double Service Valves; Lift Fittings; Suction Strainers; Vacuum Governors; Damper Regulators; Vent Traps and Vent Valves; Boiler Return Traps; Boiler Protectors; Air Separating Tanks; Expansion Joints; Steam and Oil Separators.

Webster Series "78" Traps for use at "Process" pressures (10 to 100 lb. per sq. in.).

WEBSTER MODERATOR SYSTEM

The Following Description and the Diagrammatic Illustration on the Following

Page Explain the Principles of the Webster MODERATOR System

The Principles of the Webster MODERATOR System

The Webster MODERATOR System solves the overheating problem by obtaining the following results:

Fully automatic variation for changes in outdoor temperature; shutting off or turning on radiation; variation of steam pressure; variation in vacuum.

Convenient manual variation for changes in weather conditions other than temperature and for quick heating up and night load conditions.

Properly operated, this system varies the supply of steam to the entire heating system and to all parts of it in accordance with changes in demand resulting from changes in weather and occupancy conditions.

The Webster MODERATOR System does not control the temperature in each room, but moderates the excesses of overheating and underheating.

Why These Results Are Desirable

In order to understand why these results are desirable it is necessary to examine briefly the operation of conventional low-pressure steam heating systems. Conservative engineers for years past have aimed to provide boilers, piping and radiation of such size that the inside temperature of the building may be maintained at 70° F. with an outdoor temperature of 0° F. (more or less, depending on location). This basic assumption has been generally used to determine the *maximum size or maximum output* of the conventional system.

Since this severe load exists only on rare occasions it is necessary to throttle or *moderate* the output most of the time to prevent overheating, with its discomfort and waste. When the weather *moderates* the supply of heat must be correspondingly *moderated* or reduced.

Existing means for *moderating* inside heating fall far short of the desired end. They only partially solve the problem of conforming the supply of heat to changes in demand. Using the present methods it is necessary to fill the entire system with steam before the furthest radiators can be kept warm, resulting in overheating and window opening where heat is less needed. The methods usually employed for limiting the amount of steam depend on manual attention, which they rarely get. Tenants and employees, having no pecuniary interest in reducing fuel waste, find it easier to "moderate" room temperature by opening the windows.

Thermostatic control devices on individual radiators have been successful in maintaining inside temperatures within fixed limits, but in most cases they aggravate rather than reduce the wastes due to window opening. However, thermostatically controlled radiator supply valves, together with the Webster MODERATOR System, make an ideal combination which may be used wherever desired.

How It Works

Air Circulating System—The Air Compressor (1) maintains a constant pressure on a small air line leading to the Roof Thermostat (2). The amount of air flowing past the valve of the Roof Thermostat (2) and into the line A-B is varied by changes in outdoor temperature. This air is continuously discharged to the atmosphere at (B) through a restricted opening. When the temperature decreases, the amount of air flowing into

line A-B increases and the pressure ahead of (B) is correspondingly increased. When temperature increases, amount of air flowing into A-B decreases and pressure ahead of (B) is correspondingly increased.

The area of the restricted opening at (B) may be changed by the operating engineer by merely moving the Variator lever (C). Reducing the opening increases the pressure ahead of (B); increasing the opening decreases the pressure. The pressure ahead of (B) is therefore always under the influence of both the Roof Thermostat and the Variator; the operation of one does not nullify the effect of the other, but the air pressure produced ahead of (B) is always the result of operation of both units.

Control Panels—The air pressure ahead of (B) is transmitted to a Sylphon Bellows. A change in the pressure ahead of (B), resulting from a change in outdoor temperature or in Variator setting, expands or contracts the Sylphon Bellows and thus produces a mechanical movement.

Pilot Valve—The mechanical movement produced by the Sylphon Bellows or Mercury Balance is transmitted to the Pilot Valve (E), causing a flow of oil through the circuit.

Oil Circuit—Oil pressure is maintained by a pump built into the Air Compressor Unit (1). Movement of the Oil Pilot Valve (E) in one direction sends additional oil to the operating piston of the Main Steam Control Valve (4), opening this valve and increasing the steam supply until the difference in pressure between supply and return is maintained equal to the air pressure ahead of (B). Movement of the Oil Pilot Valve in the opposite direction produces an opposite effect by permitting oil to flow from the operating piston of the Main Steam Control Valve back to the Oil Reservoir at (1).

Sylphon Bellows—A second Sylphon Bellows is connected to the steam main and a third Sylphon Bellows to the return main. These two Sylphon Bellows are rigidly connected with a third Sylphon Bellows (subject to the air pressure at (B)) in such a manner that a movement of either operates the Oil Pilot Valve. In other words an increase in steam pressure, due to shutting off certain radiators or to increase in boiler pressure or other causes, results in a mechanical movement of the bellows which operates the Oil Pilot Valve.

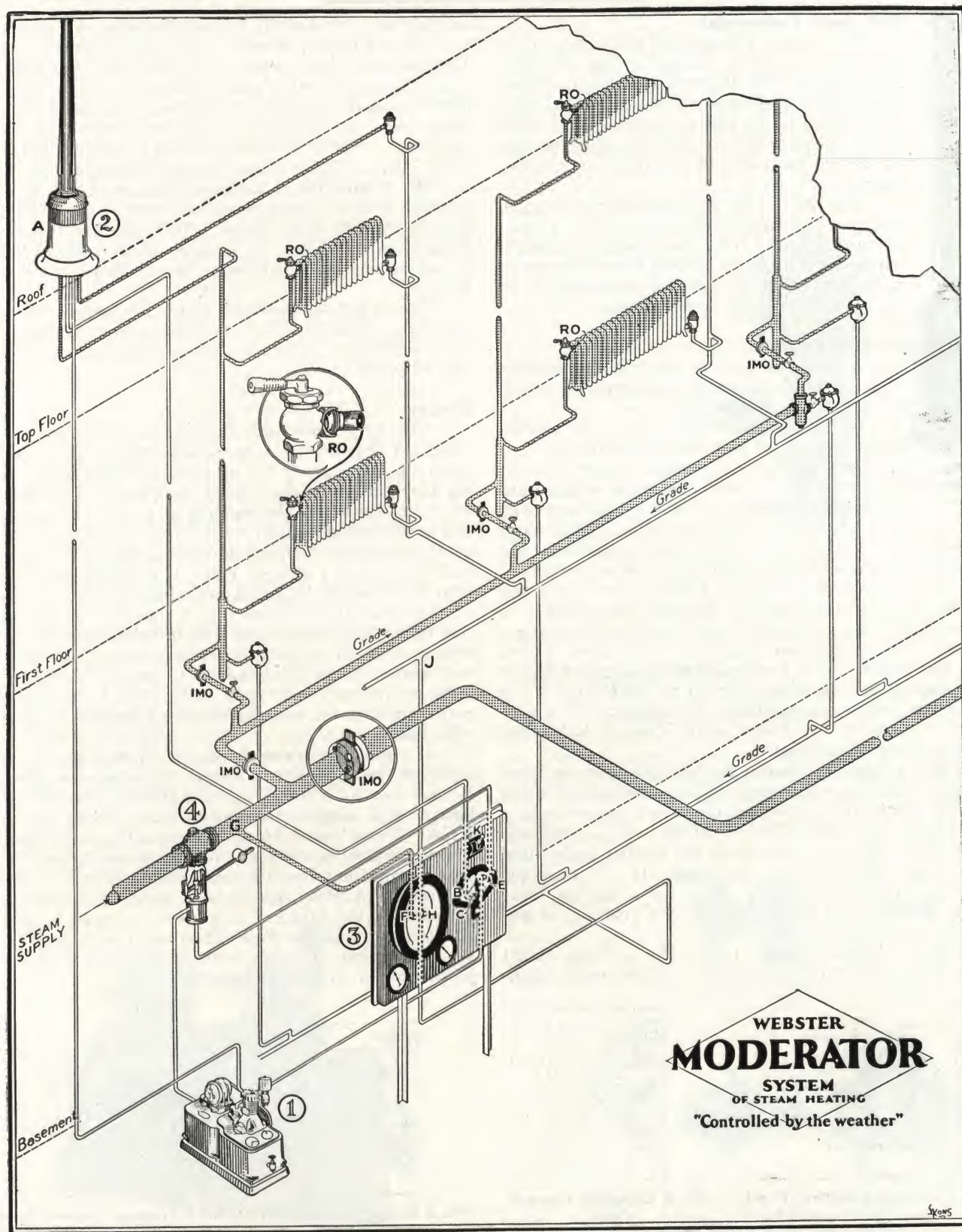
Orifices—The amount of steam delivered to all or any part of the system is dependent on the difference in pressure between the point from which the flow starts and the point at which the flow terminates.

In the MODERATOR System at mild outdoor temperatures, say 60°, the amount of steam passing the Main Steam Control Valve would be very slight and in the normal system would fill only the main and possibly a few of the nearest radiators. By introducing resistance to flow at appropriate points (called Metering Orifices) we assure that any change in steam flow through the Main Steam Control Valve will be reflected in a corresponding change to every radiator. Intermediate Metering Orifices are installed in the branch mains and riser laterals. Radiator orifices are installed in the nipple of each radiator supply valve.

The Variator—The Variator is the only manual

control necessary in the standard MODERATOR System. Normally the MODERATOR System furnishes enough heat to all parts of a building to maintain comfortable temperature without excessive overheating and without underheating for condition of average wind and daylight. For unusual conditions, such as excessive wind or dark clouds, added heat can be provided by moving the Varia-

tor Lever from normal (or 100%) to a higher percentage. For heating up quickly in the morning, the Variator can be moved to double heat, or 200%. For night load conditions it is usually desirable to shut off heat completely, but where this is not possible the Variator can be set as low as 50% to keep a moderate heat on the building.



Diagrammatic Arrangement of Elements of Webster Moderator System

Webster MODERATOR System Equipment

The basic MODERATOR System Control Equipment consists of a Roof Thermostat, a Control Panel, an

Air Compressor and Oil Pump Unit, a Main Steam Control Valve and Special Metering Orifices.



Roof
Thermo-
stat

The Roof Thermostat

The Roof Thermostat gives the "Controlled-by-Weather" feature of the MODERATOR System. The thermostat elements consist of an outer steel tube and an inner brass tube. The difference in linear expansion of these metals operates the air valve, varying the flow of air in proportion to changes in outdoor temperature.

The entire unit is supported on a rugged cast iron base and provision is made to protect all working parts from the weather. Constant temperature of valve parts is assured by steam jacketing. The air valve is protected by an easily accessible, fine mesh screen.

Control Panels

Made in a number of different models, each designed for particular operating conditions and size of buildings.

No. 2 Control Panel—Used for installations ranging in size from 10,000 sq. ft. of radiation to the very largest, where the arrangement is such as to permit the conventional grouping of equipment in the basement with one Main Steam Control Valve. This panel includes the Variator, an instrument to indicate and record air pressure produced by the combined action of the Roof Thermostat and the Variator (or steam and return pressure difference if desired); two gauges to indicate the steam pressure and the return pressure. Three Sylphon Bellows operate the Oil Pilot Valve.

No. 3 and No. 4 Control Panels—Applicable for installations of minimum size up to 20,000 sq. ft. of radiation, where conventional arrangement of equipment is possible and Main Steam Control Valve can be located in a basement.

No. 4 Panel—Includes the Variator, and the three Sylphon Bellows which operate the standard Oil Pilot Valve. This panel is particularly to be preferred where the likelihood of operating attention is at a minimum, such as is usually the case with the smaller boiler-fired jobs using relatively low cost fuel. It will be noted that No. 4 Panel performs all of the operating functions of the No. 2 Panel but does not provide for any record or indication of pressure.

No. 3 Panel—Similar to the No. 4 Panel except that it has, in addition, a mercury column used to indi-

cate but not record steam and return pressure difference.

No. 5 Control Panel—A secondary control panel. The secondary panel cannot be used alone but only in conjunction with other panel equipment. This type of panel is used to operate main Steam Control Valves where these are located at a remote distance from the basement. Three Sylphon Bellows operate the Oil Pilot Valve. There is no Variator included.

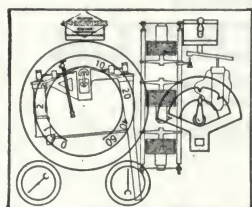
No. 6 and No. 7 Control Panels—Used in conjunction with a secondary control panel as none of them include the Oil Pilot Valve which operates the Main Steam Control Valve. In all other respects No. 6 Panel is similar to No. 2 Panel; No. 7 Panel to No. 3 Panel.

The selection of these panels depends upon the operating conditions of the individual installation. However, No. 6 meets most of the requirements of this type of panel.

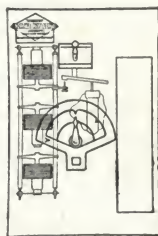
Zoning

Our experience with the MODERATOR System has indicated that zoning may be dispensed with in most cases and particularly for all parts of the building having the same normal hours of occupancy. The control of steam delivery to the building as a whole by one central means lessens materially the need for supplementary control of various zones. However, in certain types of buildings where a section or two of the building requires heat for a much longer period than the main portion of the building, provision can be made by (1) making this section a separate zone with suitable valve arrangement to shut off the portion not in use or (2) *not* placing the section under MODERATOR Control. If either of these provisions is not made, steam must be kept on the entire building for unnecessarily long periods and waste will result.

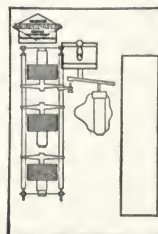
If two or more zones are desired they may be provided in the MODERATOR System by means of Manual Branch Control Valves (Variable Orifices) installed just beyond the single MODERATOR Main Steam Control Valve. These branch control valves will provide manual control, modifying delivery of steam to each zone. Each branch valve may be set at any position from 0 to 150% of normal. Corrections for sun, wind, etc., on certain portions of the building may thus be made by hand. At the same time, the Roof Thermostat will continue to vary the supply of steam to the building as a whole in proportion to outdoor temperature.



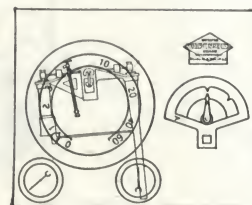
No. 2 Complete Control Panel
Primary and secondary combined, with pressure indication and record



No. 4 Complete Control Panel
Primary and secondary combined, without pressure indication and record



No. 5 Secondary Control Panel
Without pressure indication and record

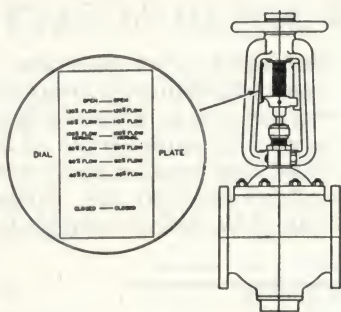


No. 6 Primary Control Panel
Used in conjunction with secondary panel. Has pressure indication and record

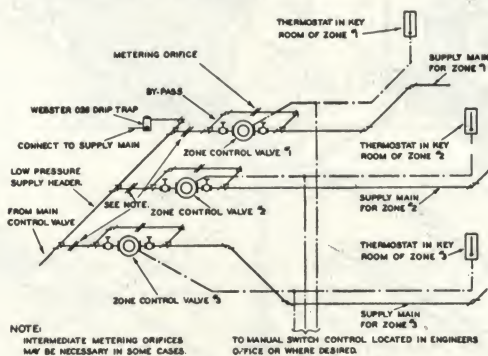
Automatic Zoning—

If manual zoning is not considered sufficient, semi-automatic zoning may be provided by means of electrically or pneumatically operated valves. The main is divided beyond the Moderator Main Steam Control Valve and each branch provided with a Moderator Control Valve connected to a key-room thermostat in the zones served (and also to a switch in the control panel if desired). A bypass is provided around this valve with a fixed orifice of size sufficient to permit enough steam to flow into the zone to heat the mains and risers.

"Three-Point" Valve—Where demand for heat cannot be predicted or where an unusual degree of flexibility is desired, the Webster "Three-Point" Valve can be used to advantage. This is a radiator supply valve which is, in effect, a zoning valve on each radiator. To meet various demands for heat, the valve may be set at *shut*, *normal* or *excess* position, the latter giving 140% of normal steam requirements. For detailed description see page 12.



Webster Manual Branch Valve for Zoning



Diagrammatic Arrangement of Automatic Zone Control Equipment

Air Compressor and Oil Pump Unit Type "B"

The standard Air Compressor and Oil Pump Unit Type "B" consists of a single cylinder, air cooled air compressor, driven through a twin V-rope drive by a $\frac{3}{4}$ hp. General Electric motor.

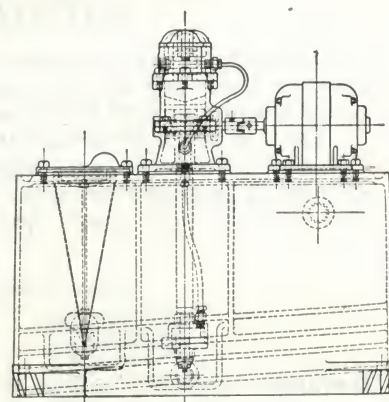
Included in the base of the unit is an oil tank holding ten gallons of oil in the operating range and of ample storage space for oil that returns when the system is shut down.

An oil relief valve of the weighted type assures constant oil pressure to the Oil Pilot Valve. An oil level gauge, visible at all times, provides full instructions for filling the tank with oil and the periodical drawing off of water and sludge. The oil pump is of



**Standard Type B
Air Compressor and Oil Pump Unit**

the piston type driven by a cam on the crank shaft of the air compressor. All assemblies are removable as units through the top of the base and can be replaced by new units with the minimum amount of pipe work. Where arrangement of equipment is such that it is desirable to have separate sources of compressed air and oil supply, the air compressor and oil pump can be furnished as individual units.



Oil Pump Unit

Special Main Steam Control Valve

The main steam control valve is a piston or sleeve type valve fitted for minimum clearance at the actual operating temperature of the valve.

The sleeve is fitted with V ports specially designed to pass a predetermined quantity of steam. This valve is non-wire drawing at high pressure and is also seatless.

It is provided with a suitable piston for hydraulic operation together with necessary counterweight.



Left

Main Steam Control Valve

If control system is thrown out of operation, valve automatically opens wide and allows steam to circulate through heating system

Special Metering Orifices

These orifices are manufactured to an accuracy which will deliver steam within one per cent of the calculated amount.

Metering orifices for radiators are made of monel metal to resist erosion and corrosion resulting from steam flow and mounted integrally in the union connection of the supply valve to the radiator.

For installation in branch mains and riser laterals they are made of $\frac{3}{8}$ in. brass plate and provided with two copper asbestos gaskets and suitable lugs for mounting in pipe lines between union flanges or with companion flanges.

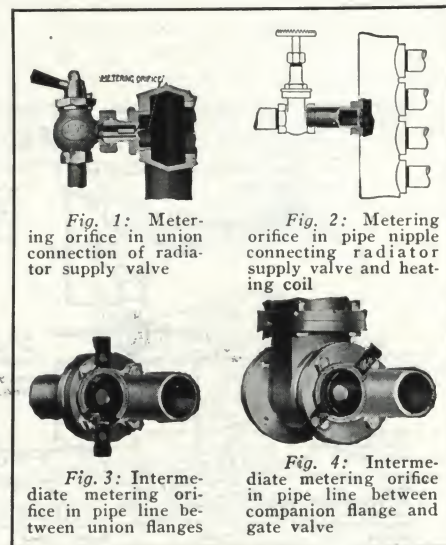


Fig. 1: Metering orifice in union connection of radiator supply valve

Fig. 2: Metering orifice in pipe nipple connecting radiator supply valve and heating coil

Fig. 3: Intermediate metering orifice in pipe line between union flanges

Fig. 4: Intermediate metering orifice in pipe line between companion flange and gate valve

Special Metering Orifices

IMPROVED WEBSTER VACUUM SYSTEM

Basically, this is the well-known Webster Vacuum System with the addition of a specially selected standard metering orifice in each radiator valve.

The IMPROVED System assures correct distribution of steam—all radiators get steam at the same time and substantially in proportion to the need for steam. Eliminates the last "cold spot," operates equally well with

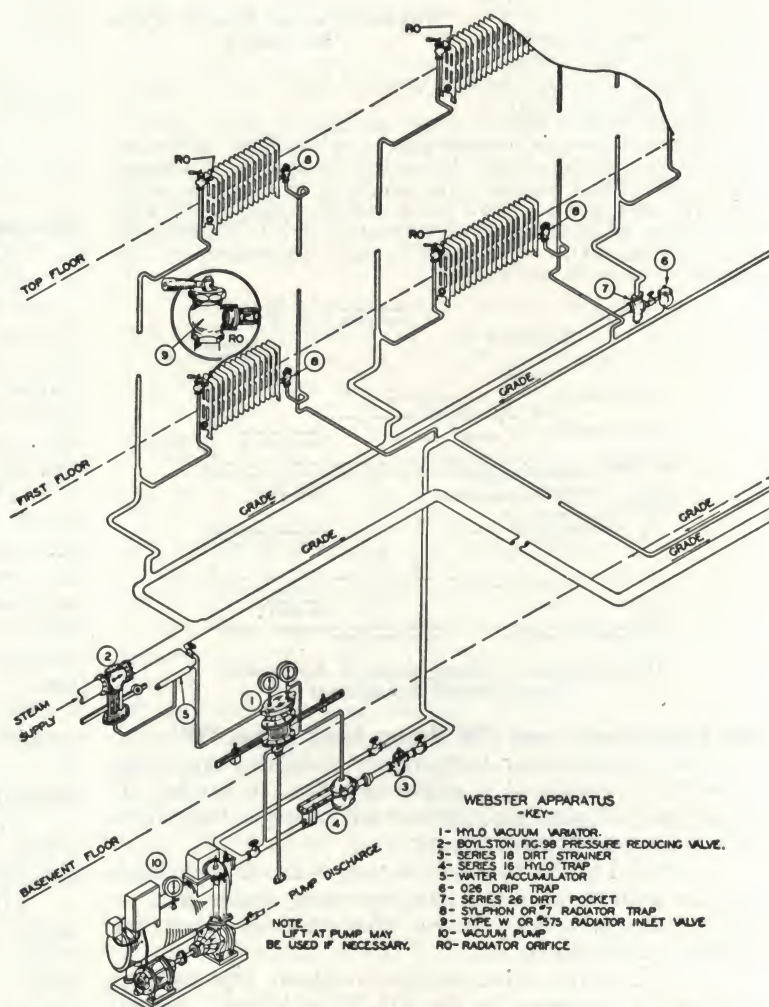
fluctuating boiler pressures, high and low vacuum. Increases flexibility; permits quicker heating up; paves the way for economy producing operation through the application of a wide choice of centralized control methods. Operating requirements of the newer fuels such as oil and gas are fully met. Better-than-ever heating service with older fuels is obtained.

Operation

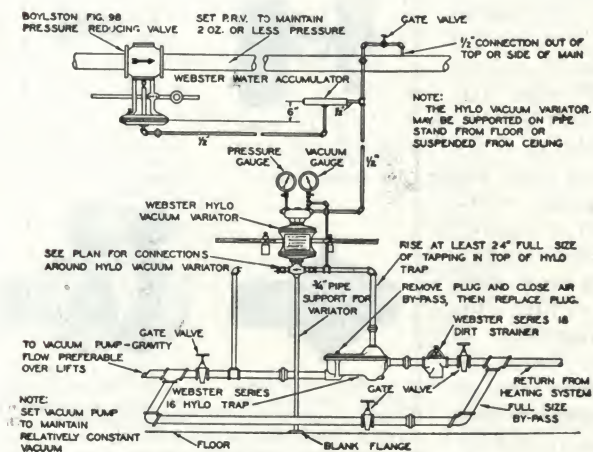
Pressure on supply mains is controlled by a Fig. 98 Boylston Reducing Valve operated either manually or by a key-room thermostat. Steam is admitted to radiators through Webster Supply Valves, each equipped with a specially selected metering orifice. Condensation and air are discharged from radiators into return mains through Webster Return Traps, which prevent discharge of steam, thus avoiding waste. The return mains are connected to the suction end of a vacuum pump, which draws out the condensate and air. The air is discharged to atmosphere and the water returned to the boiler. A Webster Boiler Protector may be used to prevent breakage of the boilers should the water level become inadequate.

Webster HYLO Vacuum Variator

A manual control for use with IMPROVED Vacuum Systems. This device, used in conjunction with IMPROVED Webster Vacuum Systems, provides a means for regulating manually, according to outside temperature and weather conditions, the amount of steam supplied to the entire system. Two regulating weights are moved by hand to various positions on a graduated beam, each position representing a pressure difference for a certain condition of outside temperature and weather. Economy of operation, surpassed only by the MODERATOR System, is obtainable with an IMPROVED System using the HYLO Vacuum Variator.



Diagrammatic Arrangement of the IMPROVED Webster Vacuum System Using the Webster Hylo Variator and Radiator Metering Orifices



Method of Installing HYLO Vacuum Variator

Metering Orifices

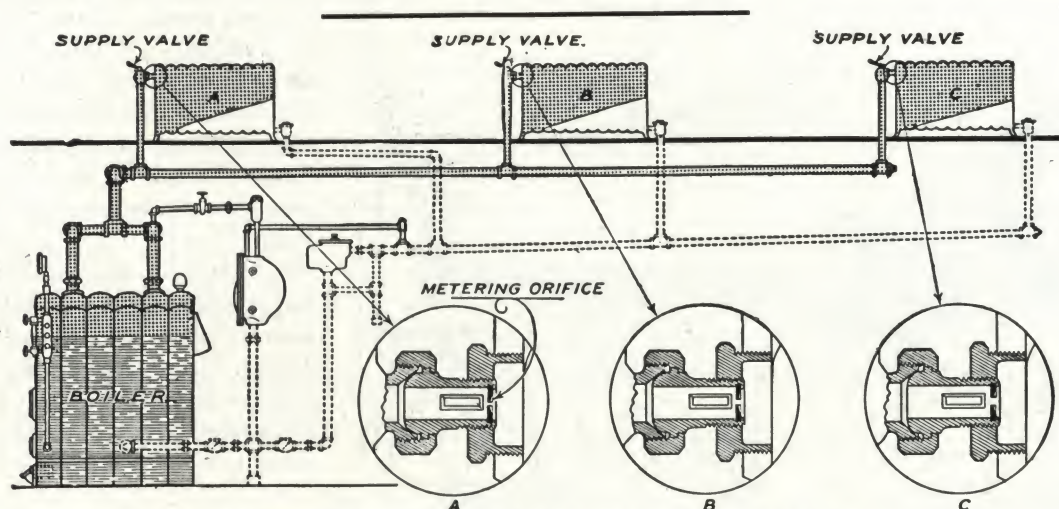
Standard metering orifices are made in a wide range of sizes for all types of valves. The size to be installed at each radiator is selected by the Webster engineer, who is equipped with complete data to make proper selection. In the older type of system the nearest radiator got warm first and the furthest radiator did not begin to get warm until the others were filled. In the IMPROVED Webster Vacuum System, the use of metering orifices insures that all radiators get steam at the same time and substantially in proportion to the need for steam.

The metering orifice in the radiator nearest the source of steam supply is quite small. When steam reaches this radiator the amount that can enter is restricted. The result is that steam soon flows on through the piping to the next radiator where the orifice is slightly larger and, therefore, the restriction proportionately less. And so it goes, radiator by radiator, to the furthest point. The "pressure drop" to each radiator has been equalized by the installation of the properly sized metering orifice and all the radiators in the system receive the required amount of steam. This principle is clearly shown in the diagrammatic sketch of the IMPROVED Type "R" System at the top of page 8.

IMPROVED WEBSTER TYPE "R" SYSTEM

This Webster System is specially fitted for use with oil and gas burners, light-weight radiation and installations where burners are controlled by a thermostat located in a "key" room. In addition improved heating service is obtained with coal and older fuels and with older types of radiation. As in the IMPROVED Vacuum System a specially selected standard meter-

ing orifice is placed in each radiator valve to provide equalized and balanced steam distribution. The IMPROVED Webster Type "R" System is an open return or gravity system adaptable to any type of building in which the boiler may be placed with its water-line below the level of water of condensation flowing back to it.



Diagrammatic Sketch of the IMPROVED Type "R" System

Showing how "pressure drop" is equalized or balanced by installation of standard metering orifices of proper size

Operation

Initial steam pressure may be controlled by the sensitive Webster Damper Regulator. Steam is admitted to the radiators through Webster Supply Valves which are equipped with specially selected metering orifices.

Condensate and air are discharged from radiators into the return mains by Webster Return Traps and then carried by gravity to a Webster Vent Trap, which automatically vents air from the system. Return of water to boiler is assured by the Webster Boiler Return Trap.

Advantage of the Improved Type "R" System

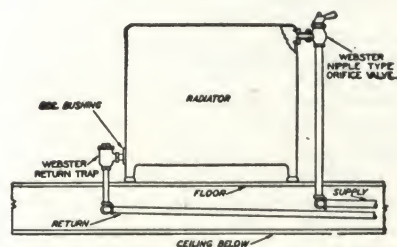
With the IMPROVED Type "R" System it is no longer impossible to quickly build up a reasonable pressure on a boiler. This difficulty with old type systems was due to the fact that the "pressure chamber" included the boiler and all of the piping and radiators—a really enormous space to be filled with steam and kept filled before a pressure difference and positive flow of steam could be created. The use of metering orifices closes off the larger portion of the radiator space and thus materially reduces the size of this "pressure cham-

ber." The result is a much shorter time for the heating-up period.

In the average vapor system, when the fire in the boiler is banked, steam reaches only the first few radiators. With the IMPROVED System, the available steam is distributed proportionately to each radiator. Another advantage of this proportionate distribution is that in mild weather "hot water" temperatures will be maintained in the radiators, i.e., the radiator temperatures will vary with the demand for heat.

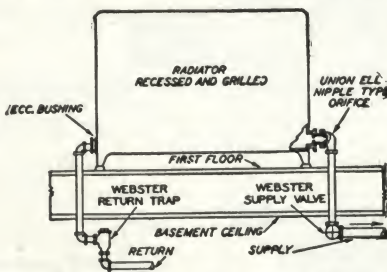
The damper regulator can be set to maintain the desired pressure and the fire will build up this pressure without being unduly forced. This is because the metering orifices are *checking* the flow of steam into the radiators, making it easy to build up a pressure in the boiler and piping which serves to deliver some steam to *every* radiator.

Where the damper is connected to an automatic temperature control system, the advantages of even distribution afforded by the IMPROVED Type "R" System are also obtained. In this case the damper regulator is actually a safety device preventing the boiler pressure from rising above the maximum for which the regulator is set.



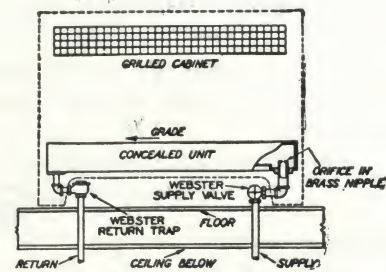
Typical Method of Making Supply and Return Connections to Radiators

Using Webster Supply Valves with standard nipple-type metering orifices and Webster Return Traps



Another Typical Method of Making Supply and Return Connections to Radiators

Using Webster Supply Valve, Webster Return Trap and standard metering orifice in nipple of brass union elbow



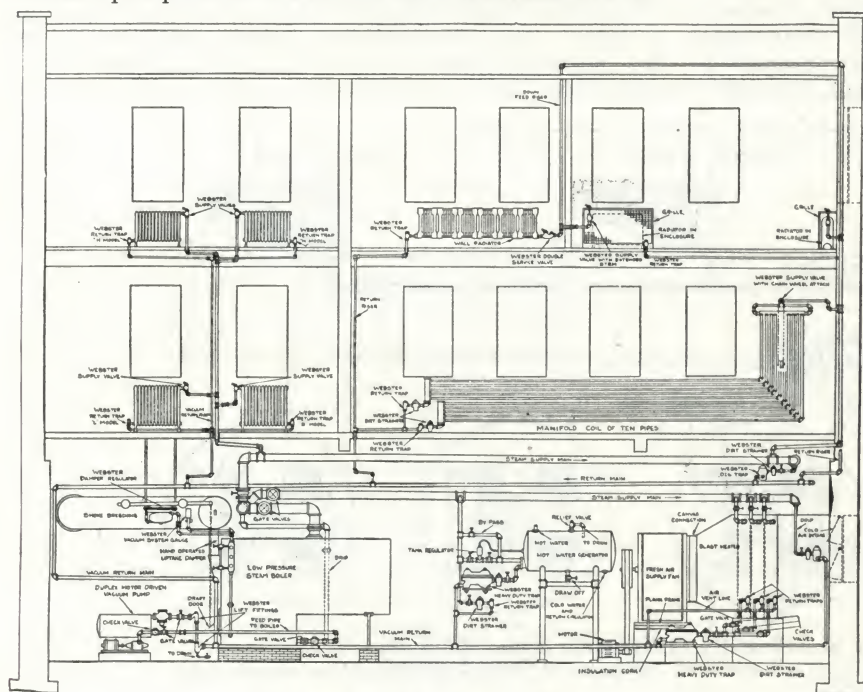
Typical Method of Making Supply and Return Connections to Light-weight Radiation

Using Webster Supply Valve, Webster Return Trap and standard metering orifice in brass pipe nipple

WEBSTER VACUUM SYSTEM

A two-pipe system, the return mains of which are joined together and connected to the suction end of a vacuum pump which draws out the condensate and air.

For large buildings of every type, for groups of buildings and for many varied conditions.



Typical Webster Vacuum System

Diagrammatic layout using a low pressure boiler and motor-driven vacuum pumps, with up-feed riser shown at left and down-feed riser at the right, illustrating two of many possible arrangements. The flexibility of Webster Vacuum System permits many variations in piping arrangements, radiation and other equipment

Operation

A partial vacuum is created and maintained by a steam or power driven vacuum pump. Steam is admitted to radiators or other heating units through Webster Valves. Condensation and air are discharged from each heating unit through Webster Return Traps which close to prevent the passage of steam, thus preventing waste.

Water of condensation and air are removed from the system through the return piping by the vacuum pump. The air is discharged to the atmosphere and the water is returned to the boiler by means suited to particular conditions.

Bulletin

Write for *Bulletin No. B-500* containing detailed description of Webster Vacuum Systems. It will be sent promptly on request.

WEBSTER TYPE "R" SYSTEM

This system is adaptable to almost every type of building, except the very largest—practically the only limitation being the necessity for a basement or other depression so that the boiler may be placed with its water line below the level of water of condensation flowing back to it. For use with cast iron or steel boilers

burning any type of fuel. The simplicity of the piping arrangements and the safety provided by the Webster Boiler Return Trap and Vent Trap combination, together with the elimination of power consuming devices, all combine to make the Webster Type "R" System particularly suitable for many installations.

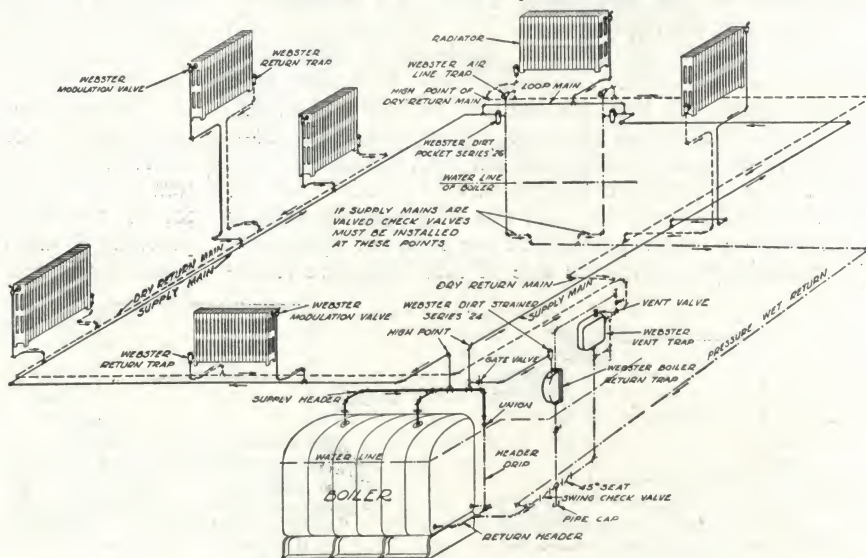
Operation

Initial steam pressure may be controlled by a sensitive Webster Damper Regulator. Steam is admitted to radiators through Webster Supply Valves. Condensation and air are discharged from radiators by Webster Return Traps, and carried to a Webster Vent Trap, which automatically vents air from the system through a vent valve, permitting operation under partial vacuum for long periods under certain conditions.

Return of water to boiler is assured by Webster Boiler Return Trap.

Bulletin

For complete information concerning Webster Type "R" Systems, write for *Bulletin No. B-600*, which will be sent promptly on request.



Typical Webster Type "R" System

Showing the supply and return mains graded in opposite directions, the supply away from the boiler and the return line toward the boiler. The ends of the mains are dripped through a Webster Dirt Pocket and the air that collects at the ends of the mains is relieved through a Webster Thermostatic Trap. The returns from these drips are carried back to the boiler through a pressure wet return line. Both the vent trap and boiler return trap are placed adjacent to the boiler

WEBSTER SYSTEM EQUIPMENT

Used as needed in Webster Systems of Steam Heating and includes the following:

Webster Boiler Return Trap and Vent Trap Combination

Quick circulation, despite variations in boiler pressures, is assured in Webster Type "R" Systems through the combination of the Webster Boiler Return Trap and Vent Trap. Air escapes from the system through the Webster Vent Valve. Water returns direct to the boiler by gravity at low pressures. An increase of pressure causes the Webster Boiler Return Trap to fill and operate, equalizing the pressure and making positive the prompt return of water to the boiler. Units are made to provide six sizes of the Webster Boiler Return Trap and Vent Trap combination, having the range of capacities given in Table I.

Webster Boiler Return Trap—Positive acting reciprocating device for returning water to boilers in Webster Type "R" Systems.

Construction of sizes 0023, 023 and 123 is shown in Fig. 1. The float is of heavy gauge metal with no exposed seams. The entire mechanism is held in place by two studs and is removable as a unit. It turns on a single monel metal shaft. Steam valve opens quickly when high level is reached. No wire drawing. Valves are all-metal and self-aligning. Operation is silenced by stainless steel bumper springs and large area baffle.

Webster Vent Trap with Vent Valve—Used in conjunction with the Webster Boiler Return Trap, to provide a dependable method of removing air from heating systems and automatically preventing its return, at the same time making overflow of condensation impossible.

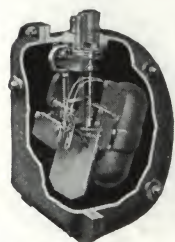


Fig. 1. Webster Boiler Return Trap

TABLE I. BOILER RETURN TRAP CAPACITIES

Size No.	*Range in sq. ft.
0023	Up to 1500
023	1500 to 2500
123	2500 to 4000
223	4000 to 8000
323	8000 to 16,000
**623	16,000 to 32,000

*Equivalent to direct cast iron radiation.

**Uses 2-323 boiler return traps with duplex vent trap.



Fig. 2. Webster Vent Trap

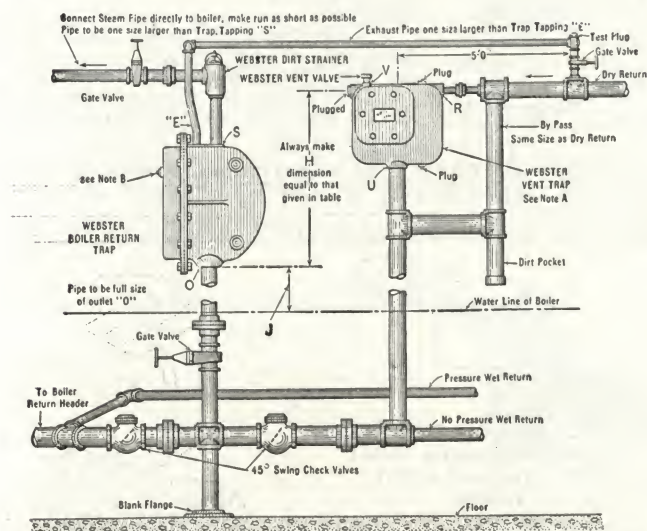


Fig. 3. Conventional Arrangement of Webster Type "R" System Equipment

TABLE II. DIMENSIONS IN FIG. 3*

Size boiler return trap	Rating sq. ft. direct radiation	Dimensions		Tappings			Number of 1/2-in. vent valves	Size vent trap	Tappings		
		H	J	O	S	E			R	U	V
0023	1500	14 1/4	5	1 1/2	3/4	1 1/2	1	0023	1	1	1 1/2
023	2500	16 3/4	6	2	1 1/4	1 1/2	1	023	1	2	1 1/2
123	4000	18 3/4	6	2 1/2	1 1/4	1 1/2	1	123	1 1/4	2 1/2	1 1/4
223	8000	23	6	3 fig.	1 1/2	2	2	223	1 1/4	3 fig.	1 1/4
323	16000	26 3/4	6	3 1/2 fig.	1 1/2	3	3	323	1 1/4	3 1/2 fig.	1 1/4

*All dimensions in inches.

Webster Boiler Protector

Provided to prevent breakage in low pressure cast iron boilers when the water level becomes inadequate. Automatically supplies raw water to boiler when water level reaches set position. It is primarily a protective device, but may be used as a boiler feeder.

Body is made of cast iron with three principal parts bolted together. Interior parts of copper, brass or monel metal to withstand corrosion. Seamless float of standard type actuating cone valve on sharp-edged seat. Water valve with standard Jenkins composition disc actuated by difference in water pressure between exterior and interior of Syphon Bellows to which it is attached.

Adapted to almost all types of low pressure heating boilers where maximum pressure will not exceed 15 lb. per sq. in. Maximum cold water main pressure is 150 lb. per sq. in.; minimum is 20 lb. per sq. in.

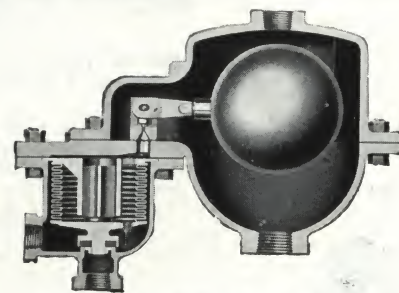


Fig. 4. Webster Boiler Protector

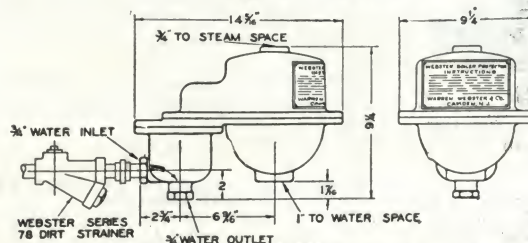


Fig. 5. Roughing-in Dimensions of Webster Boiler Protector

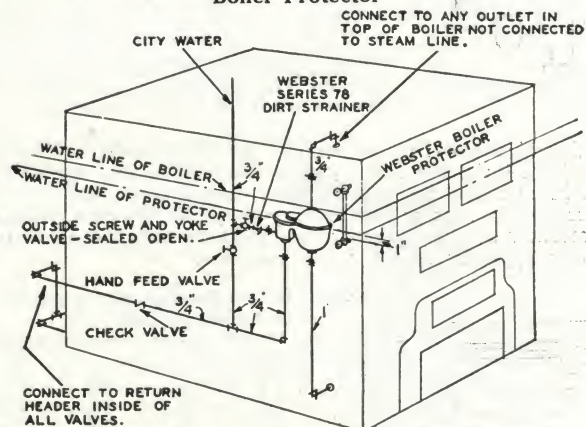


Fig. 6. Method of Installing Webster Boiler Protector

Webster Damper Regulator

Used for controlling dampers on boilers. Used with Webster Vacuum and Type "R" Systems of Steam Heating where very low steam pressure is normally maintained to insure circulation. Controls and maintains pressure of only a few ounces.

The well, diaphragm casing and plates are made of cast iron, the lever of steel, and the diaphragm of rubber. An asbestos disc between the lower casing and the well prevents the transfer of heat to the diaphragm chamber from the steam in the upper part of the well.

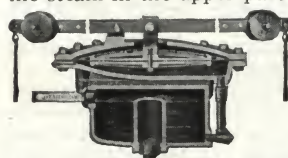


Fig. 7. Webster Damper Regulator

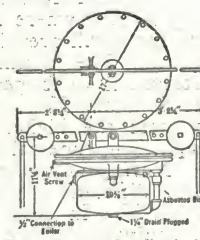


Fig. 8. Dimensions Damper Regulator

Webster Traps

Six different types of low pressure traps are provided for use in Webster Systems to discharge condensation

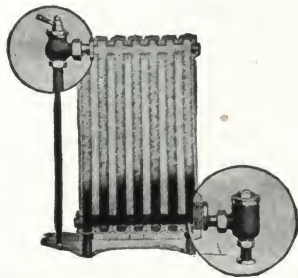


Fig. 9. Application of Webster Supply Valve and Webster Trap to Typical Radiator

tion and air from radiators, drips, unit heaters, blast radiation, etc., giving a choice to meet every operating condition.

Webster Sylphon Trap—Original and highly perfected type of low pressure thermostatic bellows trap.

Effectively discharges all condensation and entrained air from radiators or coils without permitting passage of steam.

Operation is by means of a liquid contained in the rugged sylphon bellows.

Factory adjusted, and made in sizes from 1/2 to 1 in. which will handle up to 750 lb. of condensation per hour at 1 lb. pressure difference.

Maximum pressure 10 lb. per sq. in.

For normal operating pressures not exceeding 5 lb. per sq. in.

See Table V for Ratings.



Fig. 10. Webster Sylphon Trap

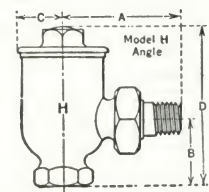


TABLE III. WEBSTER SYLPHON TRAP DIMENSIONS*

Size	A	B	C	D
1/2-512	3 1/8	1 5/8	1 1/8	4
3/4-513	3 1/8	1 3/4	1 1/8	4 1/8
1/2-522	3 1/4	1 7/8	1 1/8	5 1/4
3/4-523	3 1/4	2	1 1/8	5 3/8
1-533	4	2 3/8	1 3/4	5 3/8
1-534	4	2 5/8	1 3/4	5 5/8

*All dimensions in inches.

**Sizes 513 and 523 can be supplied with 1/2-in. inlet nipples if specified on order.

Specification—The return end of every radiator shall be provided with a Webster Sylphon Trap. The size of the trap shall be as called for on the plans. Installation shall be made in accordance with the standard practice of WARREN WEBSTER & COMPANY who will provide the contractor with service details showing approved methods of connection.

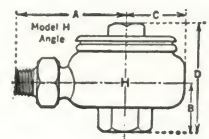


TABLE IV. WEBSTER NO. 7 TRAP DIMENSIONS*

Size	A	B	C	D
1/2-712	3 1/4	1 1/8	1 1/8	3
1/2-722	3 1/2	1 1/8	1 1/8	3 1/8
3/4-713	3 3/4	1 1/8	1 1/8	3 1/8
3/4-723	3 3/4	1 1/8	1 1/8	3 1/8
1-733	4 1/2	1 7/8	2 1/4	4 1/8

*All dimensions are in inches.

Webster No. 7 Return Trap—A return trap of the highest quality and efficiency. Has as operating member a multiple flat diaphragm made of phosphor bronze. Made in sizes 1/2 and 3/4 in. with same ratings as sylphon trap. See Table V.

Webster No. 7-M Trap—This trap is used where normal operating pressures will prevail up to 15 lb. per sq. in. The maximum occasional pressure is 25 lb. per sq. in. The No. 7-M Trap is similar to the Standard No. 7 type, but has been still further reinforced to meet the higher pressures by heavy gauge monel metal diaphragm, cone valve piece and seat insert.

Ratings—Ratings of the above Webster Return Traps for three different conditions of pressure difference are given in Table V. In each case the rating is given in square feet of equivalent direct cast iron radiation. In the selection and sizing of traps individual consideration and careful judgment should be used, and the table should never be followed blindly.

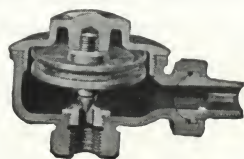


Fig. 11. Webster No. 7 Trap

TABLE V. RATINGS OF WEBSTER LOW PRESSURE RETURN TRAPS*

Size and symbol of trap, in.	Sylphon and No. 7		
	Type "R" Systems for residences and other small buildings	Type "R" Systems for schools, apartments, factories and public buildings, etc.	Vacuum Systems for all types of buildings
	Press. diff. 4 oz.	Press. diff. 8 oz.	Press. diff. 1 lb.
1/2-512 & 712, 3/4-513 & 713	75	105	150
1/2-522 & 722, 3/4-523 & 723	125	175	250
3/4-533 & 733, 1-534	375	530	750

No. 7-M			
Size trap	5 lb.	10 lb.	15 lb.
712M-713M	335	475	580
722M-723M	555	792	967
733M	1675	2376	2900

*In square feet of cast iron radiation.

1 sq. ft. of radiator is assumed as condensing 1/4 lb. of steam per hour for this table.

Specification—The return end of every radiator shall be provided with a Webster No. 7 Return Trap. The size of the trap shall be as called for on the plans. Installation shall be made in accordance with the standard practice of WARREN WEBSTER & COMPANY who will provide the contractor with service details showing approved methods of connection.

Webster 026-T Drip Trap—A heavy duty trap, capable of handling large volumes of condensation and air, and at the same time compact and light in weight. Suited for drips of mains, blast radiation, unit heaters and similar applications. The specifications calling for a heavy duty float-type trap is fully met, while the advantages of the thermostatic element and ease of installation are both retained.

Outlet opening 1 1/4 in. on end permits the discharge of water, or water and air. An opening in the cover of the trap is provided so that air may be discharged separately when desired. In the bottom of the trap are two plugged openings which serve for cleaning and flushing.

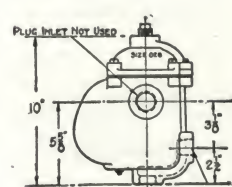


Fig. 12. Webster Drip Trap

Two inlet openings of 1 1/4 in. are provided. Weight complete only 18 lb., so that it may be handled easily and mounted in pipe line without other support. Maximum working pressure, 15 lb. per sq. in.

TABLE VI. RATINGS OF WEBSTER 026 DRIP TRAP

Press. diff., lb. per sq. in.	1/4	1/2	1	2	5	7 1/2	10	15
Lb. per hr., condensation	500	650	900	1170	1460	1630	1800	2200

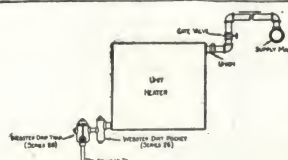


Fig. 13. Dripping Unit Heater Through a Webster 026-T Drip Trap and a Dirt Pocket

Specification—The ends of mains, drip points, return ends of blast coils and unit heaters shall be provided with Webster 026-T Heavy Duty Drip Traps. The sizes of these traps shall be as called for on the plans. They shall be installed according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster 026-O Drip Trap—Similar to the 026-T Drip Trap but without thermostatic element.

Preferred for all applications where concentration of air does not occur, such as on ends of mains and risers, flash tanks and dripping gravity heating systems into vacuum return lines.

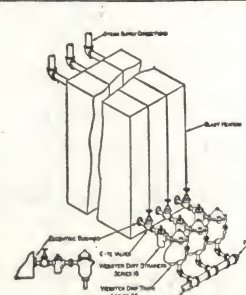


Fig. 14. Dripping Blast Heaters Through Webster 026-T Drip Traps

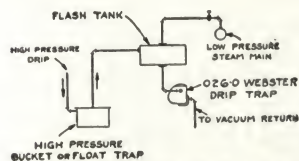


Fig. 15. Dripping a Flash Tank Through a Webster 026-O Drip Trap

Specification—At drip points where concentration of air does not occur, Webster 026-O Heavy Duty Drip Traps shall be provided. They shall be installed according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Heavy Duty Trap, Series 19-T—Used to remove condensation where it accumulates in large quantities, as in large steam mains, hot water generators and fan heater coils. Operates on the float principle for discharge of condensation and has a large water outlet to withdraw it quickly from the unit to be drained. Air is discharged through thermostatic bypass. Sizes, $\frac{3}{4}$ to 2 in.

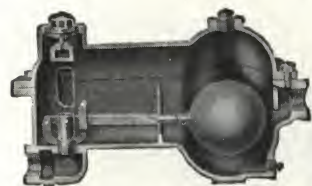


Fig. 17. Webster Heavy Duty Trap, Series 19-T

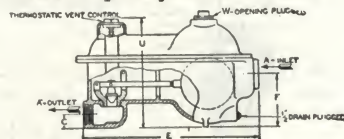


Fig. 16. Webster 026-O Drip Trap

Symbol	A	C	E	F	U	W
0019-T	$\frac{3}{4}$	1	12 $\frac{5}{8}$	1 $\frac{1}{2}$	9 $\frac{1}{2}$	$\frac{1}{2}$
019-T	1	1	15	4 $\frac{1}{8}$	9 $\frac{3}{4}$	$\frac{3}{4}$
119-T	1 $\frac{1}{4}$	1 $\frac{1}{2}$	18 $\frac{3}{4}$	5 $\frac{1}{2}$	11 $\frac{1}{2}$	1
219-T	2	1 $\frac{5}{8}$	19 $\frac{3}{4}$	6 $\frac{1}{8}$	13 $\frac{1}{4}$	1 $\frac{1}{2}$

*All dimensions in inches.

TABLE VIII. RATINGS OF WEBSTER HEAVY DUTY TRAPS, SERIES 19-T

Size of trap	Pressure difference through the valve							
	$\frac{1}{2}$ lb.	1 lb.	2 lb.	3 lb.	4 lb.	5 lb.	10 lb.	15 lb.
	Pounds of water per hour							
0019-T	700	1000	1400	1700	2000	2200	3150	3900
019-T	1250	1800	2500	3050	3600	4000	5700	7000
119-T	2100	3000	4200	5100	6000	6700	9500	11700
219-T	5600	8000	11200	13600	16000	17900	25300	31100

No allowance made for pressure drop in the connecting piping between radiation and trap or from trap through run-out to return.

Webster Heavy Duty Trap, Series 16—Similar to Series 19-T, but has no thermostatic means for discharge of air. Used to discharge condensation from gravity heating systems into vacuum return lines.

Specification—The ends of mains and drip points shall be provided with Webster Heavy Duty Drip Traps as called for on the plans. They shall be installed according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Syphon Packless Quick-opening Supply Valve

Opens with less than a turn of lever or wheel handle. Positively packless, having flexible laminated syphon bellows completely enclosing stem. Body of steam brass, composition disc, bakelite handle.

Made in $\frac{1}{2}$ to 2-in. sizes.

Made in angle, right-hand, left-hand and straightway models with lever, wheel, lockshield and extension stem handles.

See Table XI for ratings.

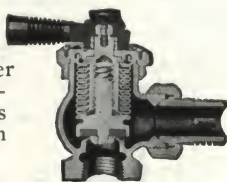
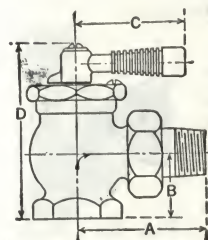


Fig. 18. Webster Syphon Packless Quick-opening Valve

TABLE IX. WEBSTER SYLPHON PACKLESS Q. O. VALVE DIMENSIONS*

Size	All types				Lever handle type	Wheel handle type
	A	B	C	D	D	D
$\frac{1}{2}$	2 $\frac{5}{8}$	1 $\frac{1}{2}$	2 $\frac{3}{8}$	3 $\frac{3}{8}$	4 $\frac{11}{16}$	
$\frac{3}{4}$	2 $\frac{3}{4}$	1 $\frac{1}{2}$	2 $\frac{3}{8}$	3 $\frac{3}{8}$	4 $\frac{7}{8}$	
1	3 $\frac{1}{8}$	1 $\frac{3}{4}$	2 $\frac{7}{8}$	4 $\frac{1}{4}$	6	
1 $\frac{1}{4}$	3 $\frac{3}{8}$	1 $\frac{7}{8}$	2 $\frac{7}{8}$	4 $\frac{3}{8}$	6 $\frac{3}{8}$	
1 $\frac{1}{2}$	3 $\frac{7}{8}$	2 $\frac{1}{8}$	2 $\frac{7}{8}$	5 $\frac{1}{8}$	6 $\frac{7}{8}$	
2	4 $\frac{3}{8}$	2 $\frac{1}{4}$	2 $\frac{7}{8}$	5 $\frac{3}{8}$	7 $\frac{1}{4}$	

*All dimensions in inches.



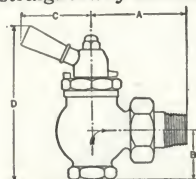
Lever Handle Type

Webster Type "W" Modulation Valve

This is a valve of the highest quality both in design and construction. So designed that admission of steam is varied in progressive volume with the lift of the valve piece. Is quick-opening—opening and closing in less than a single turn of the handle.

With the exception of the disc and handle, all parts are of high grade steam brass. Outside is nicked with polished connections. Handles are special, non-heat conducting composition.

Made in angle, right-hand, left-hand and straightway models with either lever, wheel, lockshield and extension steam handle. Sizes $\frac{1}{2}$ to 1 $\frac{1}{4}$ in.



Lever Handle Type

TABLE X. WEBSTER TYPE "W" VALVE DIMENSIONS*

Size	A	B	C	D (lever)	D (wheel)
$\frac{1}{2}$	2 $\frac{3}{4}$	1 $\frac{1}{4}$	2 $\frac{1}{8}$	4 $\frac{1}{8}$	4 $\frac{1}{8}$
$\frac{3}{4}$	2 $\frac{3}{4}$	1 $\frac{1}{2}$	2 $\frac{1}{8}$	4 $\frac{3}{8}$	4 $\frac{3}{8}$
1	3 $\frac{1}{8}$	1 $\frac{3}{4}$	2 $\frac{1}{8}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$
1 $\frac{1}{4}$	3 $\frac{1}{2}$	2	2 $\frac{1}{4}$	6	6 $\frac{3}{8}$

*All dimensions in inches.

Ratings—Ratings of Webster Valves for three different conditions of pressure difference are given in Table XI. In the selection and sizing of valves individual consideration and careful judgment should be used, and the table should never be followed blindly.

TABLE XI. RATINGS OF WEBSTER SUPPLY VALVES*

Size of valve, in.	Type "R" Systems for residences and other small buildings	Type "R" Systems for schools, apartments, public buildings, etc.	Vacuum systems all types of buildings
	Press. diff. 4 oz.	Press. diff. 8 oz.	Press. diff. 1 lb.
$\frac{1}{2}$	35	50	75
$\frac{3}{4}$	80	110	160
1	130	185	265
1 $\frac{1}{4}$	225	315	450
1 $\frac{1}{2}$	365	515	725
2	365	515	725

*In square feet of cast iron radiation.

Specification—Each radiator shall be provided with a Webster Type "W" Modulation Supply Valve [Webster Syphon Packless Quick-opening Valve] of such size as called for on the plans. Installation shall be made according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster "Three-point" Valve

Designed especially for MODERATOR and IMPROVED Webster Systems where orifices are used to obtain correct distribution. This valve includes a sleeve orifice fitting into the seat opening and easily replaceable if radiation or occupancy changes require a new orifice size. Valve may be set at shut, normal and excess position, the latter giving 140% of normal steam requirements. This feature is especially desirable for hospitals, hotels, etc., where quick heating-up or higher temperature are desired in different rooms.

Where the excess position is not desired, the dial on valve cover may be reversed and the stop pin changed. When reversed the dial shows only open and shut positions. Installation of "Three-point" Valve with special sleeve provides for future installation of MODERATOR or IMPROVED Systems by simply removing valve interior and inserting correctly sized orifice.

With the exception of the disc and handle, all parts are of high grade steam brass. Outside is nicked with polished connections. Handles are special, non-heat conducting composition.

Made in angle, right-hand, left-hand and straightway models with either lever, wheel, lockshield and extension steam handles. Sizes $\frac{3}{4}$ to 1 $\frac{1}{4}$ in.

TABLE XII. WEBSTER "THREE-POINT" VALVE DIMENSIONS*

Size	A	B	C	D (lever)	D (wheel)
$\frac{3}{4}$	2 $\frac{3}{4}$	1 $\frac{1}{2}$	2 $\frac{1}{8}$	4 $\frac{1}{8}$	4 $\frac{1}{8}$
1	3 $\frac{1}{8}$	1 $\frac{3}{4}$	2 $\frac{1}{8}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$
1 $\frac{1}{4}$	3 $\frac{1}{2}$	2	2 $\frac{1}{4}$	6	6 $\frac{3}{8}$

*All dimensions in inches.

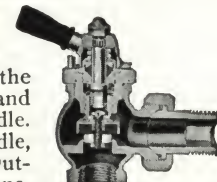


Fig. 19. Webster Supply Valve Type "W"

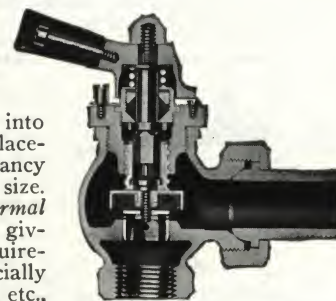
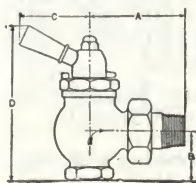


Fig. 20. Webster "Three-point" Valve



Lever Handle Type

Webster Double Service Valves

The purpose of this valve is to simplify piping connections in down-feed risers as used in one-story buildings, where they effect important savings in pipe-fitting labor. It performs double service—combines a thermostatic trap with a quick-opening valve. Acts as trap for draining down-feed riser and as a radiator supply valve.

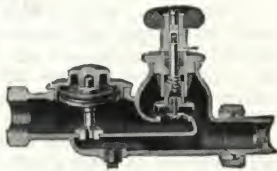


Fig. 21. Webster Double Service Valve

TABLE XIII. WEBSTER DOUBLE SERVICE VALVE DIMENSIONS*

Size		A	B	C	D	E	F
Inlet	Outlet						
3/4	3/4	3 3/8	1	2 3/8	6 1/4	9 1/8	1
1	1	3 3/4	1 1/4	2 3/8	6 3/8	9 1/2	1
1 1/4	1 1/4	4 1/8	1 3/8	2 3/8	7 3/4	10 1/2	7/8
1 1/2	1 1/2	4 1/2	1 3/8	2 3/8	7 3/4	10 3/8	1

*All dimensions in inches.

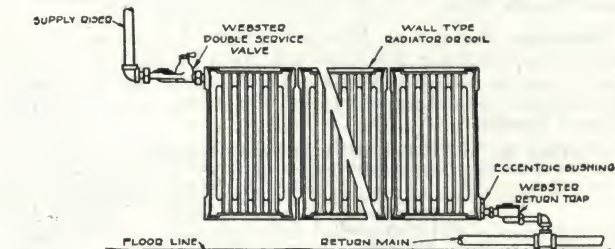


Fig. 22. Application of Webster Double Service Valve

Specification—Webster Double Service Valves shall be provided for such radiators as called for on the plans. Installation shall be made according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Dirt Strainers

Placed in return lines of steam heating systems to catch dirt, rust, scale and other particles, preventing them from impairing the tightness of traps. More dependable than pockets made of pipe and fittings, cost less to install, and are more readily cleaned.

Sizes from 1/2 to 2 in.



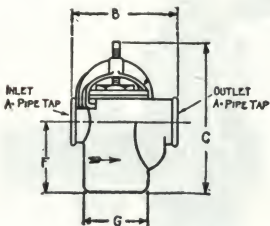
Fig. 23. Webster Dirt Strainer

TABLE XIV. WEBSTER DIRT STRAINER DIMENSIONS*

Symbol	Size, A	Class B—Straightway			
		B	C	F	G
018	3/4	4 1/4	6	2 3/4	2 1/2
118	1 1/4	5 1/2	7 3/8	3 3/8	3 1/4
218	2	7 1/4	9 1/4	4 3/4	4 1/4

Note: 1/2, 1 and 1 1/2 in. sizes are secured by bushing the next larger strainer.

*All dimensions are in inches.



Specification—Webster Dirt Strainers shall be provided at points indicated on the plans and in the sizes specified. Installation shall be made according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Suction Strainers

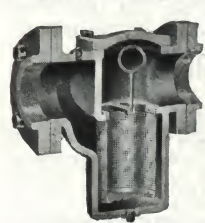


Fig. 24. Webster Suction Strainers

Installed ahead of vacuum pumps to keep dirt and scale, brought down with condensation from vacuum system, from damaging pump with its resultant troubles.

Made of heavy cast iron with flanged connections and generous dimensions throughout to provide adequate capacity. Cleanout cover is bolted on with composition gasket joint. Baskets are easily removable for cleaning.

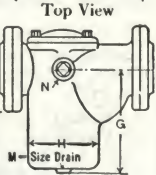
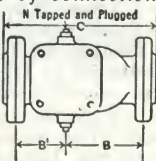


TABLE XV. WEBSTER SUCTION STRAINER DIMENSIONS*

Size, A	B	B ¹	C	E	G	H	J	K	M	N
2	5 5/8	4 3/8	12	6	6 7/8	5 1/4	4 3/4	4-5/8x2	1 1/2	3/4
3	6 5/8	4 7/8	13 3/4	7 1/2	8 7/8	5 3/4	6	4-5/8x2 1/4	1 1/2	3/4
4	8 5/8	5 1/8	16 3/8	9	10 7/8	7 1/2	7 1/8	8-5/8x2 3/4	2 1/2	3/4
5	9 5/8	6 3/8	18 3/8	10	12 7/8	8 3/4	8 1/2	8-5/8x2 3/4	2 1/2	3/4
6	10 1/8	7 1/8	20 7/8	11	13 1/2	9 3/8	9 1/2	8-5/8x3 1/4	2 1/2	3/4
8	14 1/8	9 7/8	27 3/4	13 1/2	21	14 3/4	11 3/4	8-5/8x3 1/4	3 1/2	1
10	17 1/4	11 3/4	32 3/4	16	24 3/8	16 3/4	14 3/4	12-5/8x3 1/2	3 1/2	1
12	21	12 3/8	38	19	29	20	17	12-5/8x3 1/2	3 1/2	1

*All dimensions in inches and subject to slight variation.

Note: Connection N is provided on one side for line leading to vacuum gauge and on other side for cold water connection.

Webster Dirt Pocket

Should be used in all cases where "pipe-and-fittings" pockets are ordinarily used, on ends of mains, drips from pipe coils, unit heaters and similar points. Ordinarily they save the cost of cutting four threads and six pipe fittings. Made in four sizes as noted in dimension Table XV.



Fig. 25. Webster Dirt Pocket

TABLE XVI. WEBSTER DIRT POCKET DIMENSIONS*

Symbol	Size		C	D	E	F	G	H	J
	A	B							
526	1 1/4	1	1	3/4	1 3/4	1 3/8	1 7/8	1	6 7/8
826	2	1 1/4	1 1/4	1	2 1/4	1 5/8	2 3/8	1 1/2	7 7/8
1026	2 1/2	1 1/4	1 1/4	1 1/4	2 5/8	1 3/4	2 3/4	1 5/8	9 1/4
1226	3	1 1/4	1 1/4	1 1/4	3 1/8	1 3/4	3 1/8	1 7/8	10 3/8

*All dimensions in inches.

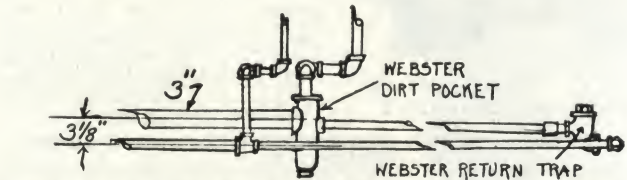


Fig. 26. Application of Webster Dirt Pocket at Drip Points Saves Head Room and Costs Less than Ordinary Pipe and Fittings

Specification—Webster Dirt Pockets shall be provided at points indicated on the plans and in the sizes specified. Installation shall be made according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Series "78" Dirt Strainers

The Webster Series "78" Dirt Strainer has been designed to be placed ahead of every Webster Series "78" Trap located at a drip point in the supply piping or attached to apparatus which is likely to contain core sand, pipe scale, or sediment.



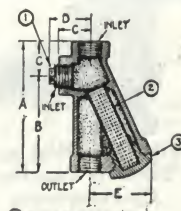
Fig. 27. Webster Series "78" Dirt Strainer

TABLE XVII. WEBSTER SERIES "78" DIRT STRAINER DIMENSIONS*

No. of Strainer	Tappings		Dimensions				
	Inlet	Outlet	A	B	C	D	E
782	1/2	1/2	4 1/2	3 3/8	1 1/2	1 3/8	2 1/4
**782B	1/2	1/2	4 1/2	3 3/8	1 1/2	1 3/8	2 1/4
783	3/4	3/4	4 1/2	3 3/8	1 1/2	1 3/8	2 1/4
784	1	1	5 1/2	4 3/8	1 1/2	2 3/8	3 1/4

*All dimensions in inches. Maximum working pressure 100 lb. per sq. in.

**Brass body with nickel finish.



1. PLUG FOR INLET NOT USED
2. REMOVABLE STRAINER
3. REMOVABLE STRAINER CAP

Webster Lift Fittings

The improved design of Webster Lift Fittings makes possible quicker starting of the lift and retains all the advantages of the earlier design.

For use where condensation is to be lifted to a higher level. More efficient than "lifting pockets" made of standard fittings; require less time, and costs less to install.

Sizes 3/4 to 6 in.

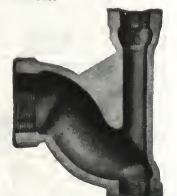


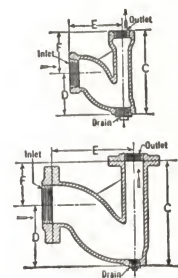
Fig. 28. Webster Lift Fitting

TABLE XVIII. WEBSTER LIFT FITTINGS DIMENSIONS*

Size	Inlet	Outlet	C	D	E	Drain
3/4	3/4 screwed	3/8 screwed	3 1/2	1 3/4	2 3/4	3/8
1	1 screwed	1/2 screwed	3 3/4	1 7/8	3 1/8	1/2
1 1/4	1 1/4 screwed	3/4 screwed	4 3/4	2 3/8	3 1/2	3/4
1 1/2	1 1/2 screwed	3/4 screwed	5 1/2	2 3/4	4 1/4	3/4
2	2 screwed	1 screwed	7 1/4	3 3/8	4 1/2	1
2 1/2	2 1/2 flanged	1 1/4 screwed	8 3/4	4 1/8	6 1/2	1
3	3 flanged	1 1/2 screwed	9 1/4	5 1/4	7 1/2	1
4	4 flanged	2 screwed	11 3/8	6 3/8	9 1/4	1
5	5 flanged	2 1/2 screwed	13 3/8	8 1/8	10 3/4	1
6	6 flanged	3 flanged	15 3/8	9 5/8	12	1

Note: When openings are flanged, the companion flanges and bolts are furnished as part of standard equipment.

*All dimensions in inches.



Specification—Where lifts occur on the vacuum return lines they shall be provided with Webster Lift Fittings of the sizes called for on the plans. Installation shall be made according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Expansion Joints

Webster Expansion Joints are constructed with cast iron bodies and brass slip sleeves, and in both single and double slip types.

The bodies of Webster Expansion Joints are provided with anchors integral with the body castings. Service connections are provided for convenience in tapping the steam main for branch piping. Drip outlets are also provided.

Made in three classes: (1) For working pressure of 15 lb. per sq. in.; (2) for 125 lb. per sq. in.; (3) for 150 lb. per sq. in.

Sizes range from 1 1/2 to 20 in., according to class. Write for complete catalogue.



Fig. 29. Webster Expansion Joint

Specification—Webster Expansion Joints shall be provided at all expansion points as called for on the plans. Installation shall be made according to the standard practice of WARREN WEBSTER & COMPANY who will provide contractor with service details showing approved methods of connection.

Webster Series "78" Traps for "Process Steam" Pressures (10 to 100 Lb. per Sq. In.)

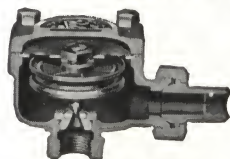


Fig. 30. Webster Series "78" Trap

A thermostatic trap used to discharge air and water of condensation from heating coils and any apparatus using steam at process pressures, i.e., 10 to 100 lb. per sq. in. Built in four sizes: 3/8, 1/2, 3/4 and 1 in. There are two classes: Class 2 for pressures of 10 to 50 lb., and Class 3 for pressures of 50 to 100 lb.

Large Savings Possible—There are many instances where the application of these traps increases production or makes large savings. A clock company recently installed steam heating coils with Webster Series "78" Traps and a complete Webster Type "R" System. The coils are used in cleaning solution and copper plating tanks where direct heating with open gas flames had formerly been used. The yearly saving amounted to \$4236.00 or two and one-half times the cost of the new equipment.

Another instance is the case of a tannery which installed steam heating coils in Webster Series "78" Traps in bleachers for heating the water. Live steam had formerly been blown into the bleachers for this purpose. As a result of using the new coils and traps, the water is now evenly heated and no leather is burned. The reduction of spoilage alone makes the heating coils worth while.

Assuring Circulation in Process Steam Installations—For efficient circulation of steam at "process" pressures (10 to 100 lb. per sq. in.) it is essential to assure free, full and continuous discharge of air from steam compartments. Air leaks in and fills the steam compartments when machine is cold; it is also frequently carried over with steam from the source of supply. The resulting reduction in efficiency is indicated in Fig. 31.

Webster Series "78" Traps and Dirt Strainers installed on each individual steam compartment provide for maximum production from process-steam-using equipment through quicker heating-up and higher maintained temperatures of heating surface.

Applications—Webster Series "78" Traps may be used to advantage in hundreds of different applications. Most of these fall into three groups.

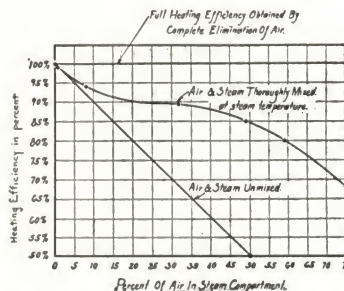


Fig. 31. Effect of Air on Heat Emission from Steam Container Based on Atmospheric Pressure Inside Container

(1) To discharge both air and water condensation from single pieces of apparatus within its capacity.

(2) For installation on each unit of a battery—as for example a battery of jacketed kettles, instead of the old-fashioned method of trying to handle the entire battery through one "master" trap.

(3) For venting air only from apparatus formerly provided with a handcock or similar inadequate means, and where a large volume of condensation is handled by a bucket type trap.

Where Used—Webster Series "78" Traps are used in heating systems, in sterilizers, in cooking and laundry apparatus, and, in the process industries on melting tanks, jacketed mixers, digesters, reaction kettles, extraction vats, pressure cookers, presses, vulcanizers, steam heated roller mills, tanks, stills, coil heaters, evaporators and dryers.

Design and Construction—Webster Series "78" Traps have been developed especially for operation at the specified pressures. Unusual construction features include automobile type copper-asbestos gasket, heavy gage monel metal diaphragm, renewable stainless steel valve piece and seat, expanded opening for quiet operation, cast steam brass body and hot forged brass cap bolted on with monel metal tap bolts.

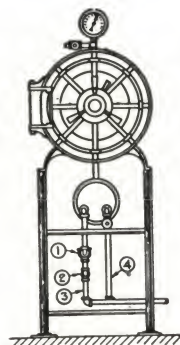
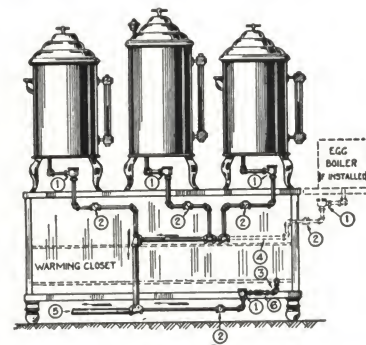
Fig. 32. Series "78" Trap on Dressing Sterilizer
No. 1 indicates TrapFig. 33. Series "78" Trap on Cooking Equipment
No. 1 indicates Traps

TABLE XIX. RATINGS OF WEBSTER SERIES "78" TRAPS*

Size of trap	Size of tappings, in.		Class 2, working pressures up to 50 lb. per sq. in.				Class 3, working pressures 50 to 100 lb. per sq. in.					
			Pressure differential, lb. per sq. in.									
			10	20	35	50	20	35	50	65	80	100
	Inlet	Outlet	Pounds of water per hour									
			20	40	80	120	30	50	68	85	100	115
780	$\frac{3}{8}$	$\frac{3}{8}$	60	95	140	185	75	110	145	180	210	245
782	$\frac{1}{2}$	$\frac{1}{2}$	130	225	330	435	165	245	325	405	470	545
783	$\frac{3}{4}$	$\frac{3}{4}$	300	465	685	900	375	550	725	900	1040	1210
784	1	1										

*Note: The pressure differentials given in this table refer to pressures existing at the inlet of the trap and in the return line.

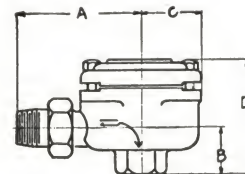
Caution—In using these ratings for selecting the proper size of Webster Series "78" Trap for any piece of apparatus special care must be taken to select the size that will be large enough to handle the maximum quantity of condensation likely to occur. This may be either when first starting up the cold apparatus or when performing maximum work for which it is designed.

TABLE XX. WEBSTER SERIES "78" THERMOSTATIC TRAP DIMENSIONS*

No. of trap	Inlet	Outlet	A	B	C	D
780	3/8	3/8	2 3/8	1 3/8	1 1/4	2 3/4
**782	1/2	1/2	3 1/2	1 7/8	1 5/8	3 1/4
783	3/4	3/4	3 3/4	1 7/8	1 7/8	3 3/8
784	1	1	4 3/8	2	2 3/8	4 3/8

*All dimensions are in inches.

**782 trap furnished on special order with 3/8-in. nipple to fit the standard 1/2-in. union nut. Other dimensions unchanged.



Specification—The return end of (insert name of unit) shall be provided with a Webster Series "78" Trap and Webster Series "78" Dirt Strainer. The size and class of the trap shall be as called for on the plans. The connections shall be made according to Webster Service Details furnished the contractor by WARREN WEBSTER & COMPANY.

Special Notice

To protect ourselves in our constant endeavor to make Webster Systems of Steam Heating and Webster System equipment even better, we reserve the right to change specifications and prices without notice.

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